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21. (Amended) A method of preparing a flexible solid intumescent fire barrier material as defined in claim 27, wherein said intumescent material comprises a mixture of hydrated alkali metal silicate and an additional ingredient selected from the group consisting of oxy boron compound, expandable graphite, and mixtures thereof.

22. (Amended) A method of preparing a flexible solid intumescent fire barrier material as defined in claim 27, wherein said intumescent material is selected from the group consisting of hydrated alkali metal silicate and at least one oxy boron compound.

23. (Amended) A method of preparing a flexible solid intumescent fire barrier material as defined in claim 27, wherein said intumescent material comprises expandable graphite.

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25. (Amended) A method of preparing a flexible solid intumescent fire barrier material as defined in claim 27, wherein said flame retardant is selected from the group consisting of a phosphorus containing material, a nitrogen containing material, and mixtures thereof.

Remarks

Claims 16, 18, 20, and 24 have been cancelled, claims 27-30 have been added, and claims 17, 19, 21-23, and 25 have been amended. Claims 17, 19, 21-23, and 25-30 now stand in the application. Support for new claims 27-30 appears generally throughout the specification and, in particular, at page 3, lines 9-14, in the Examples, and in Tables 7 and 8.

Claim Rejections - 35 USC §112

Claims 16-26 stand rejected under 35 USC §112, first paragraph, because the specification is said to not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. Claim 16 has been canceled and new independent claim 27 has been drafted to address the Examiner's concerns raised under 35 USC §112, first paragraph.

Claims 17, 19, 21, 22, and 25 stand rejected under 35 USC §112, second paragraph, because they are said to contain improper Markush language. Claims 17, 19, 21, 22, and 25 have been amended to address the Examiner's concern regarding the Markush language.

Claim Rejections - 35 USC §102

Claims 16-26 stand rejected under 35 USC §102(b or e) as being anticipated by or, in the alternative, under 35 USC §103(a) as obvious over Welna 5,578,671, Okisaki et al. 5,810,914, Horacek 6,031,040, or Goto et al. 6,124,394, in view of von Bonin et al. 4,694,030, von Bonin 4,729,853, von Bonin 5,053,148, von Bonin 5,094,780, von Bonin et al. 5,173,515, or von Bonin 5,382,387. New independent claim 27, and dependant claims 17, 19, 21-23, 25, 26 and 28, are believed to be patentable over the cited references for the following reasons.

Welna (5,578,671) discloses an intumescent putty. The term "putty" refers to "a cohesive, moldable material that does not substantially flow at ambient temperatures" (col. 1, lines 64-65). The putty is described as "indefinitely conformable" (col. 1, line 37), as having the ability to be shaped or molded by hand with ease (col. 2, lines 44-45) and as "soft and pliable" (col. 3, lines 13-14). These properties of the putty are quantified in terms of the putty's softness value which is "at least 4 mm preferably, at least 4.5 mm; more preferably at least 5 mm; and even more preferably, at least 6 mm)" (col. 1, lines 31-33).

Thus, Welna is directed to an intumescent material having a specific and desired level of softness and moldability, and all of the compositions disclosed by Welna share this property. While the Welna putty has its own utility, Welna does not recognize or appreciate the utility of an intumescent material having a softness value less than 4 mm, and it appears that such an intumescent material would not be suited for the applications for which the Welna intumescent putty was designed. Since any composition not having a softness value of at least 4 mm is undesirable according to Welna, Welna implicitly teaches away from a composition having a softness value of less than about 3.75 mm as required by new independent claim 27 of the present invention.

Moreover, Welna discloses that "water preferably comprises about 5 to 15 percent by weight of the mixture of water, oxy boron compound(s), and alkali metal silicate(s)." (See Welna, col. 4, lines 43-45) Thus, Welna also fails to teach mixing in a substantially volatile free state as required by independent claim 27.

In addition, Welna, whether taken alone or in combination with any of the cited secondary references, fails to provide any teaching or suggestion to modify the intumescent putty to not be soft (i.e. to be hard). Rather, the Welna disclosure characterizes the intumescent putty material in terms of its ability to be moldable, indefinitely conformable, and as having a softness value of at least 4 mm. If the intumescent putty were modified to have the softness value of the present invention, it would no longer be "putty" within the meaning of Welna, and would not have the utility of a putty. Thus, such a modification would change the essential character of the intumescent material and take it outside the scope of the Welna disclosure. Furthermore, because the purpose of Welna is to provide an intumescent putty, such a modification is inconsistent with the teachings of Welna. And, at the time the present invention was made, one skilled in the art would not have been motivated to make such a modification.

Okisaki et al. (5,810,914) disclose a flame retardant engineering plastic composition comprising engineering plastic, heat expandable graphite, and red phosphorus and/or phosphorus compound. Okisaki et al., however, fail to disclose, teach, or suggest a method of preparing a flexible intumescent fire barrier material including water-insoluble intumescent mineral granules, halogen-free binder, and a phosphorus containing flame retardant, wherein the composition has a softness value from about 0.01 to about 3.75 mm as defined in new independent claim 27. Rather, Okisaki et al. disclose a flame-retardant engineering plastic composition useful, for example, as an enclosure or internal parts for electronic or office appliances, as interior materials for vehicles, and as construction materials. (See Okisaki et al. at col. 1, line 10-13). The engineering plastic may be a polyester resin, a polyamine resin, a polycarbonate resin or a modified polyphenylene oxide resin. (See Okisaki et al. at col 2, line 7-10) Engineering plastics, however, are characterized by their hardness, strength, and machinability, and compete with die-cast metals such as zinc, aluminum, and magnesium in plumbing parts, hardware, and automotive parts. Engineering plastics also include ABS resin, polycarbonate, and polypropylene. Engineering plastics are, therefore, very hard. They are not flexible, would not

exhibit a softness value from about 0.01 to about 3.75 mm, and would not be suitable for making glazing strips or providing a seal.

The present invention, in contrast, provides a flexible fire barrier material useful in forming fire resistant glazing strips for metal and wool window frames, doors, dampers, and shutters, and may also provide sealing where items such as plastic pipes and electrical cables pass through an opening. (See the Abstract of the present invention). Preferred binders for the fire barrier material of the present invention include synthetic or natural isoprene rubber, ethylene propylene rubber, EPDM rubber, polybutadiene, and ethylene vinyl acetate copolymer. Such binders allow the fire barrier material of the present invention to achieve the desired flexibility. Because Okisaki et al. teach a hard engineering plastic rather than a flexible material, the teachings of this reference in no way render the present invention unpatentable.

In addition, Okisaki et al. fail to disclose a fire barrier material wherein the binder is selected from the group consisting of ethylene vinyl acetate copolymer, a synthetic or natural rubber, and mixtures thereof, as defined in dependent claim 19, or a fire barrier material including a rubber binder and having a softness value from about 0.49 to about 1.45 mm as defined in new dependent claim 28. Reconsideration is respectfully requested.

Horacek (6,031,040) discloses an intumescent mixture including thermoplastic elastomers, expandable graphite, flame retardants, inorganic fillers, and inorganic fibers. Horacek, however, fails to disclose, teach, or suggest a method of preparing a flexible intumescent fire barrier material including water-insoluble intumescent mineral granules, halogen-free binder, and a phosphorus containing flame retardant in a substantially volatile free state, wherein the composition has a softness value from about 0.01 to about 3.75 mm, as defined in new independent claim 27. The Horacek mixture includes inorganic fibers that can comprise glass, calcium phosphate or basalt, with preference being given to glass fibers. The fibers should preferably have a length of from 2 to 6 mm. Although Horacek does not disclose why the fibers are included in the mixture, they are presumably added to provide the resulting material with a certain degree of strength. The present invention, in contrast, does not include inorganic fibers and yet has excellent tensile strength properties. (See present application at page 2, line 26, and page 3, line 27). Thus, the present invention eliminates an element (inorganic fibers) and retains

the function (improved strength) of the omitted element, which is indicia of nonobviousness. MPEP 2144.04(II)(B)

In addition, subjecting the Horacek mixture to high sheer mixing would pulverize the fibers and significantly impair or effectively preclude the fibers from performing the function of providing additional strength. Accordingly, the teachings of this reference implicitly teach away from high shear mixing and in no way render the present invention unpatentable. Reconsideration is respectfully requested.

Goto et al. (6,124,394) disclose a fire retardant tablet including heat expandable graphite, and a water soluble fire retardant synergist or one containing additional water insoluble fire retardant synergist. In particular, Goto et al. provide a fire retardant tablet that contains fire retardant heat-expandable graphite and is capable of minimizing the problem crushing the heat-expandable graphite that is known to occur during high shear mixing. (See Goto et al., col. 1, line 45 to col. 2, line 9). Thus, Goto et al. teach against mixing compositions such as the composition of the present invention at high shear, and provide an entirely different solution to the problem of crushing the heat-expandable graphite that occurs during high shear mixing; namely, by providing the heat-expandable graphite in a tablet. The present invention, in contrast, found that when the composition was mixed under high shear conditions in a substantially volatile free state, a fire barrier material with desirable properties is produced.

More specifically, as explained on page 2, line 24 of the present application, the present invention discovered that compounding ingredients under high shear conditions in a substantially volatile-free condition results in fire barrier materials with improved tensile properties, improved Shore and penetrometer hardness values, and higher volumetric expansions upon exposure to fire or extreme heat when compared to formulations that were prepared with a volatile solvent or carrier present. For example, fire barrier materials produced by high shear compounding with polymer from a dried latex demonstrated significantly improved properties over control formulations with the same ingredients that were thoroughly mixed in the wet state and then allowed to dry without high shear mixing in the dry state. This is shown in Examples 1-4, the results of which are tabulated in Tables 6, 7, and 8 on pages 17 and 18 of the present application. As shown in Tables 6 and 8, the dried emulsions of Examples 1 and 3 had significantly greater ultimate strength, ultimate elongation, Shore A hardness, and expansion ratios compared with

those of Comparative Examples 2 and 4. Thus, the present invention unexpectedly found that mixing ingredients in a substantially volatile free state at high shear resulted in fire barrier materials with significantly improved properties.

Accordingly, Goto et al., fails to disclose, teach, or suggest a method of preparing a flexible intumescent fire barrier material including water-insoluble intumescent mineral granules, halogen-free binder, and a phosphorus containing flame retardant in a substantially volatile free state, wherein the composition has a softness value from about 0.01 to about 3.75, and mixing the mixture at high shear conditions as defined in new independent claim 27, and the present invention is believed to be patentably distinguishable over the Goto et al. Reconsideration is respectfully requested.

In addition, none of the cited references, whether taken alone or in combination, disclose, teach, or suggest a method of preparing a flexible solid intumescent fire barrier material wherein the binder is rubber and the resulting material has a softness value from about 0.49 to about 1.45 mm as defined in new dependent claim 28, a method of preparing a flexible solid intumescent fire barrier material wherein the resulting material has an expansion ratio at least 2.5 times greater than the same composition would have if processed under high shear conditions with volatiles present as defined in new dependent claim 29, or a method of preparing a flexible solid intumescent fire barrier material, comprising the steps of providing, in a substantially volatile free state, a mixture consisting essentially of water-insoluble intumescent mineral granules, halogen-free organic binder, and phosphorus containing flame retardant, and mixing the mixture at high shear conditions, wherein the resulting fire barrier material has a softness value from about 0.01 to about 3.75 mm as defined in new dependent claim 30.

In view of the foregoing, it is submitted that the application is in condition for allowance. Reconsideration of the application is requested.

Respectfully submitted,

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Date

By: David B Patchett
David B. Patchett, Reg. No.: 39,326
Telephone No.: (651) 736-4713

Office of Intellectual Property Counsel
3M Innovative Properties Company
Facsimile No.: 651-736-3833

Version with markings to show amendments made:

17. (Amended) A method of preparing a flexible solid intumescent fire barrier material as defined in claim [16] 27, wherein said binder [comprises at least one of] is selected from the group consisting of a thermoplastic and a thermosetting polymeric material.

19. (Amended) A method of preparing a flexible solid intumescent fire barrier material as defined in claim [16] 27, wherein said binder [comprises at least one of an] is selected from the group consisting of ethylene vinyl acetate copolymer, a synthetic or natural rubber, and mixtures thereof.

21. (Amended) A method of preparing a flexible solid intumescent fire barrier material as defined in claim [16] 27, wherein said intumescent material comprises a mixture of hydrated alkali metal silicate and [at least one] an additional ingredient selected from the group consisting of oxy boron compound, expandable graphite, and mixtures thereof.

22. (Amended) A method of preparing a flexible solid intumescent fire barrier material as defined in claim [16] 27, wherein said intumescent material [comprises a mixture] is selected from the group consisting of hydrated alkali metal silicate and at least one oxy boron compound.

23. (Amended) A method of preparing a flexible solid intumescent fire barrier material as defined in claim [16] 27, wherein said intumescent material comprises expandable graphite.

25. (Amended) A method of preparing a flexible solid intumescent fire barrier material as defined in claim [24] 27, wherein said flame retardant [comprises at least one of] is selected from the group consisting of a phosphorus containing material, a nitrogen containing material, and mixtures thereof.

Claims 27-30 are new.